```
### Status: Path 1 of [Dialog Information Services via Modem]

### Status: Initializing TCP/IP using (UseTelnetProto 1 ServiceID pto-dialog)
Trying 3106900061...Open

DIALOG INFORMATION SERVICES
PLEASE LOGON:
 ******** HHHHHHHH SSSSSSSS?
### Status: Signing onto Dialog
 ********
ENTER PASSWORD:
 ******** HHHHHHHH SSSSSSSS? ********
Welcome to DIALOG
### Status: Connected


Dialog level 00.06.30D

Last logoff:  20jun00 09:28:13
Logon file001 22jun00 08:55:30
*** ANNOUNCEMENT ***
NEW FILE RELEASED
***Prous Science Daily Essentials (Files 458, 459)
***WIPO/PCT Patents Fulltext (File 349)

UPDATING RESUMED
***Bridge World Markets News (File 609,809)
***Fort Worth Star-Telegram (File 427)
***Federal News Service (File 660)
***Kansas City Star (File 147)
***British Books in Print (File 430)

                          ***
RELOADED
***Books in Print (File 470)
***Kompass Asia/Pacific  (File 592)

>>>Get immediate news with Dialog's First Release
   news service.  First Release updates major newswire
   databases within 15 minutes of transmission over the
   wire.  First Release provides full Dialog searchability
   and full-text features.  To search First Release files in
   OneSearch simply BEGIN FIRST for coverage from Dialog's
   broad spectrum of news wires.

     >>> Enter BEGIN HOMEBASE for Dialog Announcements <<<
     >>>    of new databases, price changes, etc.      <<<
                  ****
***                                ***

File   1:ERIC  1966-2000/Jun 17
       (c) format only 2000 The Dialog Corporation
*File   1: File has been reloaded. See HELP NEWS 1.

      Set  Items  Description
      ---  -----  -----------
```

```
?begin 411
       22jun00 08:55:42 User219455 Session D638.1
            $0.22    0.062 DialUnits File1
     $0.22  Estimated cost File1
     $0.01  TYMNET
     $0.23  Estimated cost this search
     $0.23  Estimated total session cost   0.062 DialUnits

File 411:DIALINDEX(R)

DIALINDEX(R)
   (c) 2000 The Dialog Corporation plc

*** DIALINDEX search results display in an abbreviated ***
*** format unless you enter the SET DETAIL ON command. ***
?sf compsci,patents
>>>          64 does not exist
>>>         351 is unauthorized
>>>         352 is unauthorized
>>>         353 is unauthorized
>>>4 of the specified files are not available
   You have 36 files in your file list.
   (To see banners, use SHOW FILES command)
?show files

File  Name
----  -------------
   2: INSPEC_1969-2000/May W2
   6: NTIS_1964-2000/Jul W2
   8: Ei Compendex(R)_1970-2000/May W4
  34: SciSearch(R) Cited Ref Sci_1990-2000/Jun W3
  35: DISSERTATION ABSTRACTS ONLINE_1861-1999/DEC
  65: Inside Conferences_1993-2000/Jun W3
  77: Conference Papers Index_1973-2000/May
  92: IHS Intl.Stds.& Specs._1999/Nov
  94: JICST-EPlus_1985-2000/Feb W3
  99: Wilson Appl. Sci & Tech Abs_1983-2000/May
 103: Energy SciTec_1974-2000/Apr B1
 108: Aerospace Database_1962-2000/May
 144: Pascal_1973-2000/Jun W3
 202: Information Science Abs._1966-2000/Mar
 233: Internet & Personal Comp. Abs._1981-2000/Jun
 238: Abs. in New Tech & Eng._1981-2000/Jun
 239: Mathsci_1940-2000/Jul
 275: Gale Group Computer DB(TM)_1983-2000/Jun 22
 434: SciSearch(R) Cited Ref Sci_1974-1989/Dec
 647: CMP  Computer Fulltext_1988-2000/Jun W1
 674: Computer News Fulltext_1989-2000/May W4
 696: DIALOG Telecom. Newsletters_1995-2000/Jun 21
 123: CLAIMS(R)/Current Legal Status_1980-2000/Jun 06
 340: CLAIMS(R)/US Patent_1950-00/Jun 13
 342: Derwent Patents Citation Indx_1978-98/200005
 344: Chinese Patents ABS_Apr 1985-2000/Feb
 345: Inpadoc/Fam.& Legal Stat_1968-2000/UD=200023
 347: JAPIO_Oct 1976-2000/Jan(UPDATED 000611)
 348: European Patents_1978-2000/Jun W03
 349: PCT Fulltext_1983-2000/UB=, UT=20000525
```

```
 371: French Patents_1961-2000/BOPI 0023
 447: IMSWorld Patents International_2000/May
 652: US Patents Fulltext_1971-1979
 653: US Patents Fulltext_1980-1989
 654: US Pat.Full._1990-2000/Jun 20
 670: LitAlert_1973-2000/UD=200019

?s temporal databases and hyperlink and ((time or temporal(w)descriptor?) or
date)

Your SELECT statement is:
   s temporal databases and hyperlink and ((time or temporal(w)descriptor?)
or date)

          Items   File
          -----   ----
              1     2: INSPEC_1969-2000/May W2

   1 file has one or more items; file list includes 36 files.

?begin 2
       22jun00 08:58:00 User219455 Session D638.2
            $0.56    0.450 DialUnits File411
     $0.56  Estimated cost File411
     $0.15  TYMNET
     $0.71  Estimated cost this search
     $0.94  Estimated total session cost   0.513 DialUnits


File   2:INSPEC  1969-2000/May W2
       (c) 2000 Institution of Electrical Engineers

      Set  Items  Description
      ---  -----  -----------
?s temporal databases and hyperlink and ((time or temporal(w)descriptor?) or
date)
            1077  TEMPORAL DATABASES  (January 1993)
             125  HYPERLINK
          926723  TIME
           55001  TEMPORAL
            4586  DESCRIPTOR?
               4  TEMPORAL(W)DESCRIPTOR?
           27188  DATE
      S1       1  TEMPORAL DATABASES AND HYPERLINK AND ((TIME OR
                  TEMPORAL(W)DESCRIPTOR?) OR DATE)
?t 1/9/1

 1/9/1
DIALOG(R)File   2:INSPEC
(c) 2000 Institution of Electrical Engineers. All rts. reserv.

4999824   INSPEC Abstract Number: C9509-6130M-006
 Title: Multimedia interchange using SGML/HyTime. I. Structures
  Author(s): Newcomb, S.R.
  Journal: IEEE Multimedia    vol.2, no.2    p.86-9
  Publication Date: Summer 1995  Country of Publication: USA
  ISSN: 1070-986X
```

U.S. Copyright Clearance Center Code: 1070-986X/95/$4.00
Language: English Document Type: Journal Paper (JP)
Treatment: Practical (P)
Abstract: HyTime is a standard neutral markup language for representing hypertext, multimedia, hypermedia and time -based documents in terms of their logical structure. Documents represented in HyTime conform fully to the ISO Standard Generalized Markup Language (SGML). In effect, HyTime extends SGML by adding certain syntactic conventions called SGML architectural forms, with which it represents certain semantic constructs. HyTime cannot be understood or evaluated without understanding, at least to some extent, the significance and usefulness of the SGML standard on which it is based. This article examines the structure of the two standards. HyTime places unprecedented demands on document processing systems-demands which they have yet to meet. For example, a full implementation of HyTime would allow one to create a hyperlink to whatever happens to be going on at a particular time and/or place in a finite coordinate space (FCS), even if the event, location and time are not yet known, because of binding- time issues. HyTime allows a document to specify where and/or when the results of traversing a hyperlink will be rendered. HyTime provides constructs for specifying how events scheduled in one FCS are to be "projected" onto another, e.g. from a 3D FCS to a 2D FCS, or from a virtual measurement domain to a real one. (2 Refs)
Descriptors: data structures; electronic data interchange; hypermedia; ISO standards; multimedia computing; page description languages; software packages; software standards; temporal databases
Identifiers: multimedia interchange; semantic constructs; HyTime; standard neutral markup language; hypertext; multimedia; hypermedia; time -based documents; logical structure; ISO Standard Generalized Markup Language; syntactic conventions; SGML architectural forms; document processing systems; hyperlink traversal; finite coordinate space; binding-time issues; event scheduling; virtual measurement domain
Class Codes: C6130M (Multimedia); C6130D (Document processing techniques); C6140D (High level languages); C6160S (Spatial and pictorial databases); C6130E (Data interchange); C6120 (File organisation)
Copyright 1995, IEE

```
?begin 411
       22jun00 09:01:27 User219455 Session D638.3
            $1.18    0.196 DialUnits File2
               $2.10  1 Type(s) in Format  9
            $2.10  1 Types
     $3.28  Estimated cost File2
     $0.20  TYMNET
     $3.48  Estimated cost this search
     $4.42  Estimated total session cost   0.708 DialUnits

File 411:DIALINDEX(R)

DIALINDEX(R)
   (c) 2000 The Dialog Corporation plc

*** DIALINDEX search results display in an abbreviated ***
*** format unless you enter the SET DETAIL ON command. ***
?sf compsci,patents
>>>          64 does not exist
>>>         351 is unauthorized
>>>         352 is unauthorized
>>>         353 is unauthorized
```

```
>>>4 of the specified files are not available
   You have 36 files in your file list.
   (To see banners, use SHOW FILES command)
?s temporal database? and hyperlink and ((time or temporal(w)descriptor?) or
date)

Your SELECT statement is:
   s temporal database? and hyperlink and ((time or temporal(w)descriptor?)
or date)

          Items   File
          -----   ----
              1     2: INSPEC_1969-2000/May W2

   1 file has one or more items; file list includes 36 files.

?s temporal (w) database? and ((time or temporal(w)descriptor?) or date)

Your SELECT statement is:
   s temporal (w) database? and ((time or temporal(w)descriptor?) or date)

          Items   File
          -----   ----
            707     2: INSPEC_1969-2000/May W2
             18     6: NTIS_1964-2000/Jul W2
            128     8: Ei Compendex(R)_1970-2000/May W4
            101    34: SciSearch(R) Cited Ref Sci_1990-2000/Jun W3
             55    35: DISSERTATION ABSTRACTS ONLINE_1861-1999/DEC
             31    65: Inside Conferences_1993-2000/Jun W3
              1    77: Conference Papers Index_1973-2000/May
             10    94: JICST-EPlus_1985-2000/Feb W3
             17    99: Wilson Appl. Sci & Tech Abs_1983-2000/May
              8   103: Energy SciTec_1974-2000/Apr B1
             10   108: Aerospace Database_1962-2000/May
            132   144: Pascal_1973-2000/Jun W3
             22   202: Information Science Abs._1966-2000/Mar
              1   233: Internet & Personal Comp. Abs._1981-2000/Jun
              9   239: Mathsci_1940-2000/Jul
             24   275: Gale Group Computer DB(TM)_1983-2000/Jun 22
              1   647: CMP  Computer Fulltext_1988-2000/Jun W1
              2   340: CLAIMS(R)/US Patent_1950-00/Jun 13
              1   345: Inpadoc/Fam.& Legal Stat_1968-2000/UD=200023
              3   348: European Patents_1978-2000/Jun W03
             12   349: PCT Fulltext_1983-2000/UB=, UT=20000525
             24   654: US Pat.Full._1990-2000/Jun 20

   22 files have one or more items; file list includes 36 files.

? s temporal (w) database? and ((time or temporal(w)descriptor?) or date?) and
(hyperlink or url)

Your SELECT statement is:
   s temporal (w) database? and ((time or temporal(w)descriptor?) or date?)
and (hyperlink or url)

          Items   File
          -----   ----
```

```
              1     2: INSPEC_1969-2000/May W2
>>>File 349 processing for DATE? stopped at DATENFRAGMENTE
              2   349: PCT Fulltext_1983-2000/UB=, UT=20000525
              1   654: US Pat.Full._1990-2000/Jun 20

   3 files have one or more items; file list includes 36 files.
   One or more terms were invalid in 3 files.

?begin 2,654
       22jun00 09:05:51 User219455 Session D638.4
            $2.61    2.085 DialUnits File411
     $2.61  Estimated cost File411
     $0.25  TYMNET
     $2.86  Estimated cost this search
     $7.28  Estimated total session cost   2.794 DialUnits


SYSTEM:OS  - DIALOG OneSearch
  File   2:INSPEC  1969-2000/May W2
         (c) 2000 Institution of Electrical Engineers
  File 654:US Pat.Full.  1990-2000/Jun 20
         (c) format only 2000 The Dialog Corp.
*File 654: Reassignment data current through 12/06/1999 recordings.
Due to recent processing problems, the SORT command is not working.

      Set  Items  Description
      ---  -----  -----------
?s temporal (w) database? and ((time or temporal(w)descriptor?) or date?) and
(hyperlink or url)
           70353  TEMPORAL
          133239  DATABASE?
            1177  TEMPORAL(W)DATABASE?
         1775951  TIME
           70353  TEMPORAL
            9621  DESCRIPTOR?
               4  TEMPORAL(W)DESCRIPTOR?
          145341  DATE?
             490  HYPERLINK
            1797  URL
      S1       2  TEMPORAL (W) DATABASE? AND ((TIME OR
                  TEMPORAL(W)DESCRIPTOR?) OR DATE?) AND (HYPERLINK OR URL)
?begin 349,654
       22jun00 09:06:52 User219455 Session D638.5
            $0.44    0.074 DialUnits File2
     $0.44  Estimated cost File2
            $0.66    0.112 DialUnits File654
     $0.66  Estimated cost File654
            OneSearch, 2 files,  0.186 DialUnits FileOS
     $0.10  TYMNET
     $1.20  Estimated cost this search
     $8.48  Estimated total session cost   2.980 DialUnits


SYSTEM:OS  - DIALOG OneSearch
  File 349:PCT Fulltext  1983-2000/UB=, UT=20000525
         (c) 2000 WIPO/MicroPatent
  File 654:US Pat.Full.  1990-2000/Jun 20
```

```
        (c) format only 2000 The Dialog Corp.
*File 654: Reassignment data current through 12/06/1999 recordings.
Due to recent processing problems, the SORT command is not working.

      Set  Items  Description
      ---  -----  -----------
?s temporal (w) database? and ((time or temporal(w)descriptor?) or date?) and
(hyperlink or url)
>>>File 349 processing for DATE? stopped at DATENFRAGMENTE
           22534  TEMPORAL
           50057  DATABASE?
              36  TEMPORAL(W)DATABASE?
         1100141  TIME
           22534  TEMPORAL
            6881  DESCRIPTOR?
               0  TEMPORAL(W)DESCRIPTOR?
          163227  DATE?
             627  HYPERLINK
            3116  URL
      S1       3  TEMPORAL (W) DATABASE? AND ((TIME OR
                  TEMPORAL(W)DESCRIPTOR?) OR DATE?) AND (HYPERLINK OR URL)
?t 1/2,ab/1-3

 1/2,AB/1     (Item 1 from file: 349)
DIALOG(R)File 349:PCT Fulltext
(c) 2000 WIPO/MicroPatent. All rts. reserv.

00697153
MULTI-PERSPECTIVE VIEWER FOR CONTENT-BASED INTERACTIVITY
VISUALISEUR MULTIDIMENSIONNEL OFFRANT UNE INTERACTIVITE ORIENTEE OBJET
Patent Applicant/Assignee:
  PRAJA INC; Address - PRAJA, INC. , 10455-B Pacific Center Court, San
    Diego, CA 92121 , US
Inventor(s):
  JAIN Ramesh C; Address - JAIN, Ramesh, C. , 4715 Reedley Terrace, San
    Diego, CA 92130 , US
  HICKS Terry Randolph; Address - HICKS, Terry, Randolph , 4240 Trias
    Street, San Diego, CA 92103 , US
  BAILEY Asquith A; Address - BAILEY, Asquith, A. , 12055 World Trade Drive
    &3, San Diego, CA 92128 , US
  MCKINLEY Ryan B; Address - MCKINLEY, Ryan, B. , 21 Santa Lucia, Orinda,
    CA 94563 , US
  KURAMURA Don Yamato; Address - KURAMURA, Don, Yamato , 10669 Indigo
    Blossom Lane, San Diego, CA 92121 , US
  KATKERE Arun L; Address - KATKERE, Arun, L. , 3899 Nobel Drive &1228, San
    Diego, CA 92122 , US
Patent and Priority Information (Country, Number, Date):
  Patent:                (WO 200010075) WO 0010075 A1 20000224
  Application:           WO 99US18376 19990812  (PCT/WO US9918376)
  Priority Application: US 98134188 19980814
Designated States: AE; AL; AM; AT; AU; AZ; BA; BB; BG; BR; BY; CA; CH; CN;
  CU; CZ; DE; DK; EE; ES; FI; GB; GD; GE; GH; GM; HR; HU; ID; IL; IN; IS;
  JP; KE; KG; KP; KR; KZ; LC; LK; LR; LS; LT; LU; LV; MD; MG; MK; MN; MW;
  MX; NO; NZ; PL; PT; RO; RU; SD; SE; SG; SI; SK; SL; TJ; TM; TR; TT; UA;
  UG; UZ; VN; YU; ZA; ZW; GH; GM; KE; LS; MW; SD; SL; SZ; UG; ZW; AM; AZ;
  BY; KG; KZ; MD; RU; TJ; TM; AT; BE; CH; CY; DE; DK; ES; FI; FR; GB; GR;
  IE; IT; LU; MC; NL; PT; SE; BF; BJ; CF; CG; CI; CM; GA; GN; GW; ML; MR;
```

NE; SN; TD; TG
Main International Patent Class: G06F-003/14;
Publication Language: English
Filing Language: English
Fulltext Word Count: 20046

English Abstract
A method and apparatus for interactively viewing a real-world environment. The viewer (400) includes a user interface having a first window (406) for displaying a two-dimensional representation of a three-dimensional model of the real world environment. The viewer (400) further includes a plurality of other viewing areas (402-424) for displaying and querying for views of the real-world environment. The viewer (400) includes a content-based event timeline (422) that graphically depicts multi-media events satisfying user queries. Several methods can be used to select an event for display. For example, the user can select an event by selecting the event representation from the timeline (422). Alternatively, the user can select an event by querying the system for selected objects, viewing angles, input devices, etc. The viewer (400) synchronizes and links together all of the multi-media data types associated with a selected event. Thus, when the user selects an event, the viewer (400) displays all of the multi-media information (such as audio/video and textual information) that is associated with selected event.

French Abstract
L'invention concerne un procede et un appareil pour visualiser de maniere interactive un environnement reel. Le visualiseur (400) inclut une interface utilisateur presentant une premiere fenetre (406) pour afficher une representation bidimensionnelle d'un modele tridimensionnel de l'environnement reel. Le visualiseur (400) inclut egalement une pluralite d'autres zones de visualisation (402 a 424) pour presenter et rechercher des vues de l'environnement reel. Le visualiseur (400) inclut en outre un sequenceur d'evenements oriente objet (422) qui represente graphiquement des evenements multimedia pour satisfaire la demande d'utilisateurs. Plusieurs methodes peuvent etre utilisees en ce qui concerne le choix d'un evenement a presenter. Par exemple, - 'utilisateur peut opter pour un evenement en choisissant la representation de l'evenement a partir du sequenceur (422). Dans un mode different, l'utilisateur peut choisir un evenement en interrogeant le systeme pour des objets choisis, des angles de visualisation, des dispositifs d'entree, etc. Le visualiseur (400) sychronise et lie ensemble tous les types de donnees multimedia associes a l'evenement choisi. Ainsi, lorsque l'utilisateur choisit un evenement, le visualiseur (400) presente toutes les informations multimedia (telles que des informations audio/video ou textuelles) associees a l'evenement choisi.

1/2,AB/2 (Item 2 from file: 349)
DIALOG(R)File 349:PCT Fulltext
(c) 2000 WIPO/MicroPatent. All rts. reserv.

00435633
IMMERSIVE VIDEO
VIDEO D'IMMERSION
Patent Applicant/Assignee:
THE REGENTS OF THE UNIVERSITY OF CALIFORNIA

JAIN Ramesh
WAKIMOTO Koji
MOEZZI Saied
KATKERE Arun
Inventor(s):
JAIN Ramesh
WAKIMOTO Koji
MOEZZI Saied
KATKERE Arun
Patent and Priority Information (Country, Number, Date):
Patent: WO 9631047 A2-A3 19961003
Application: WO 96US4400 19960329 (PCT/WO US9604400)
Priority Application: US 95414437 19950331; US 95554848 19951107
Designated States: AL; AM; AT; AU; AZ; BB; BG; BR; BY; CA; CH; CN; CZ; DE; DK; EE; ES; FI; GB; GE; HU; IS; JP; KE; KR; KZ; LK; LR; LS; LT; LU; LV; MD; MG; MK; MN; MW; MX; NO; NZ; PL; PT; RO; RU; SD; SE; SG; SI; TM; TR; TT; UA; UG; US; UZ; VN; KE; LS; MW; SD; SZ; UG; AM; AZ; BY; KG; KZ; MD; RU; TJ; TM; AT; DE; DK; ES; FI; FR; GB; GR; IE; IT; LU; MC; NL; PT; SE; BF; BJ; CF; CG; CI; CM; GA; GN; ML; MR; TD; TG
Main International Patent Class: G06K-009/20;
Publication Language: English
Fulltext Word Count: 48912

English Abstract
Immersive video, or television, images of a real-world scene are synthesized (i) on demand, (ii) in real time , (iii) as linked to any of a particular perspective on the scene, or an object or event in the scene, (iv) in accordance with user-specified parameters of presentation, including panoramic or magnified presentations, and/or (v) stereoscopically. The synthesis of virtual images is based on computerized video processing -- called "hypermosaicing" -- of multiple live video perspectives on the scene. In hypermosaicing a knowledge database contains information about the scene; for example scene geometry, shapes and behaviors of objects in the scene, and/or internal and/or external camera calibration models. Multiple video cameras each at a different spatial location produce multiple two-dimensional video images of the scene. A viewer/user specifies viewing criterion (ia) at a viewer interface. A computer, typically one or more engineering work station class computers or better, includes in software and/or hardware (i) a video data analyzer for detecting and for tracking scene objects and their locations, (ii) an environmental model builder combining multiple scene images to build a 3-D dynamic model recording scene objects and their instant spatial locations, (iii) a viewer criterion interpreter, and (iv) a visualizer for generating from the 3-D model in accordance with the viewing criterion one or more particular 2-D video image(s) of the scene. A video display receives and displays the synthesized 2-D video image(s). Nonetheless to being built and maintained by use of simplifying assumptions, the 3-D dynamic model is powerful, flexible and useful in permitting diverse scene views.

French Abstract
Des images video ou televisees d'immersion, d'une scene reelle, sont synthetisees (a) a la demande, (b) en temps reel, (c) parce qu'etant liees a une perspective particuliere sur la scene, a un sujet ou a un evenement de la scene, (d) conformement a des parametres, specifies par l'utilisateur, de presentation, y compris les presentations panoramiques ou agrandies, et/ou (e) en stereoscopie. La synthese d'images virtuelles

est fondee sur le traitement video informatise - appele "hypermosaiquage" - de perspectives video multiples en direct sur la scene. Dans l'hypermosaiquage, une base de donnees de connaissances contient des informations sur la scene, par exemple ses caracteristiques geometriques, les formes et les comportements de sujets et/ou les modeles interieurs et/ou exterieurs de calibrage des cameras. Des cameras video multiples, chacune a un emplacement spatial different, produisent des images video multiples a deux dimensions de la scene. Un spectateur, ou utilisateur, specifie un ou plusieurs criteres de vision, sur une interface pour spectateur. Un ordinateur, habituellement un ou plusieurs ordinateurs de la categorie employee pour les postes de travail industriels, ou meilleurs que cela, comprend dans son logiciel et/ou dans sa partie materielle (a) un analyseur de donnees video, pour detecter et suivre les sujets de la scene et leurs emplacements, (b) un generateur de modeles d'environnement, qui combine des images de scene multiples pour generer un modele dynamique a trois dimensions enregistrant des sujets de la scene et leurs emplacements spatiaux instantanes, (c) un dispositif d'interpretation des criteres du spectateur, et (d) un dispositif de visualisation, pour produire a partir du modele a trois dimensions, conformement au critere de vision, une, ou davantage, image(s) video de la scene, en deux dimensions. Un visuel video recoit et montre les images video a deux dimensions qui ont ete synthetisees. Bien qu'etant elabore et maintenu grace a des hypotheses simplificatrices, le modele dynamique a trois dimensions est puissant, souple et utile du fait qu'il permet d'avoir des vues diverses de la scene.

1/2,AB/3 (Item 1 from file: 654)
DIALOG(R)File 654:US Pat.Full.
(c) format only 2000 The Dialog Corp. All rts. reserv.

02888809

Utility
IMMERSIVE VIDEO, INCLUDING VIDEO HYPERMOSAICING TO GENERATE FROM MULTIPLE VIDEO VIEWS OF A SCENE A THREE-DIMENSIONAL VIDEO MOSAIC FROM WHICH DIVERSE VIRTUAL VIDEO SCENE IMAGES ARE SYNTHESIZED, INCLUDING PANORAMIC, SCENE INTERACTIVE AND STEREOSCOPIC IMAGES

PATENT NO.: 5,850,352
ISSUED: December 15, 1998 (19981215)
INVENTOR(s): Moezzi, Saied, San Diego, CA (California), US (United States of America)
Katkere, Arun, La Jolla, CA (California), US (United States of America)
Jain, Ramesh, San Diego, CA (California), US (United States of America)
ASSIGNEE(s): The Regents of the University of California, (A U.S. Company or Corporation), Alameda, CA (California), US (United States of America)
[Assignee Code(s): 13234]
APPL. NO.: 8-554,848
FILED: November 06, 1995 (19951106)

REFERENCE TO A RELATED PATENT APPLICATION

The present patent application is a continuation-in-part of U.S. patent application Ser. No. 08-414,437 filed on Mar. 31, 1995 to inventors Ramesh

Jain and Koji Wakimoto for MACHINE DYNAMIC SELECTION OF ONE VIDEO CAMERA-IMAGE OF A SCENE FROM MULTIPLE VIDEO CAMERAS-IMAGES OF THE SCENE IN ACCORDANCE WITH A PARTICULAR PERSPECTIVE ON THE SCENE, AN OBJECT IN THE SCENE, OR AN EVENT IN THE SCENE. The contents of the related predecessor patent application are incorporated herein by reference.

U.S. CLASS: 364-514 A cross ref: 348-13
INTL CLASS: [6] H04N 9-79
FIELD OF SEARCH: 364-514A; 364-410; 348-13; 348-19; 348-42; 348-51; 348-48; 273-433; 273-441; 395-119; 395-125; 395-155; 395-129; 395-162

References Cited

U.S. PATENT DOCUMENTS

5,490,239	2/1996	Myers	395-129
5,495,576	2/1996	Ritchey	395-125

PRIMARY EXAMINER: Voeltz, Emanuel T.
ASST. EXAMINER: Peeso, Thomas
ATTORNEY, AGENT, OR FIRM: Fuess & Davidenas
CLAIMS: 46
EXEMPLARY CLAIM: 1
DRAWING PAGES: 27
DRAWING FIGURES: 38
ART UNIT: 244
FULL TEXT: 3131 lines

ABSTRACT

Immersive video, or television, images of a real-world scene are synthesized, including on demand and/or in real time , as are linked to any of a particular perspective on the scene, or an object or event in the scene. Synthesis is in accordance with user-specified parameters of presentation, including presentations that are any of panoramic, magnified, stereoscopic, or possessed of motional parallax. The image synthesis is based on computerized video processing--called "hypermosaicing"--of multiple video perspectives on the scene. In hypermosaicing a knowledge database contains information about the scene; for example scene geometry, shapes and behaviors of objects in the scene, and/or internal and/or external camera calibration models. Multiple video cameras each at a different spatial location produce multiple two-dimensional video images of the scene. A viewer/user specifies viewing criterion (ia) at a viewer interface. A computer, typically one or more engineering work station class computers or better, includes in software and/or hardware (i) a video data analyzer for detecting and for tracking scene objects and their locations, (ii) an environmental model builder combining multiple scene images to build a 3D dynamic model recording scene objects and their instant spatial locations, (iii) a viewer criterion interpreter, and (iv) a visualizer for generating from the 3D model in accordance with the viewing criterion one or more selectively synthesized 2D video image(s) of the scene.
?t 1/2,kwic/3

1/2,KWIC/3 (Item 1 from file: 654)
DIALOG(R)File 654:US Pat.Full.
(c) format only 2000 The Dialog Corp. All rts. reserv.

02888809

Utility
IMMERSIVE VIDEO, INCLUDING VIDEO HYPERMOSAICING TO GENERATE FROM MULTIPLE VIDEO VIEWS OF A SCENE A THREE-DIMENSIONAL VIDEO MOSAIC FROM WHICH DIVERSE VIRTUAL VIDEO SCENE IMAGES ARE SYNTHESIZED, INCLUDING PANORAMIC, SCENE INTERACTIVE AND STEREOSCOPIC IMAGES

PATENT NO.: 5,850,352
ISSUED: December 15, 1998 (19981215)
INVENTOR(s): Moezzi, Saied, San Diego, CA (California), US (United States of America)
Katkere, Arun, La Jolla, CA (California), US (United States of America)
Jain, Ramesh, San Diego, CA (California), US (United States of America)
ASSIGNEE(s): The Regents of the University of California, (A U.S. Company or Corporation), Alameda, CA (California), US (United States of America)
[Assignee Code(s): 13234]
APPL. NO.: 8-554,848
FILED: November 06, 1995 (19951106)

REFERENCE TO A RELATED PATENT APPLICATION

The present patent application is a continuation-in-part of U.S. patent application Ser. No. 08-414,437 filed on Mar. 31, 1995 to inventors Ramesh Jain and Koji Wakimoto for MACHINE DYNAMIC SELECTION OF ONE VIDEO CAMERA-IMAGE OF A SCENE FROM MULTIPLE VIDEO CAMERAS-IMAGES OF THE SCENE IN ACCORDANCE WITH A PARTICULAR PERSPECTIVE ON THE SCENE, AN OBJECT IN THE SCENE, OR AN EVENT IN THE SCENE. The contents of the related predecessor patent application are incorporated herein by reference.

U.S. CLASS: 364-514 A cross ref: 348-13
INTL CLASS: [6] H04N 9-79
FIELD OF SEARCH: 364-514A; 364-410; 348-13; 348-19; 348-42; 348-51; 348-48; 273-433; 273-441; 395-119; 395-125; 395-155; 395-129; 395-162

References Cited

U.S. PATENT DOCUMENTS

5,490,239	2/1996	Myers	395-129
5,495,576	2/1996	Ritchey	395-125

PRIMARY EXAMINER: Voeltz, Emanuel T.
ASST. EXAMINER: Peeso, Thomas
ATTORNEY, AGENT, OR FIRM: Fuess & Davidenas
CLAIMS: 46
EXEMPLARY CLAIM: 1
DRAWING PAGES: 27
DRAWING FIGURES: 38
ART UNIT: 244
FULL TEXT: 3131 lines

ABSTRACT

...images of a real-world scene are synthesized, including on demand and/or in real time , as are linked to any of a particular perspective on the scene, or an object...

...four cameras simultaneously recording the scene of a campus courtyard at a particular instant of time .

FIG. 7 is four selected virtual camera, or synthetic video, images taken from a 116...

...view of the same courtyard previously seen in FIG. 6 at the same instant of time .

FIG. 9a is a graphical rendition of the 3D environment model generated for the same time instant shown in FIG. 6b, the volume of voxels in the model intentionally being at...by the environmental model builder of the immersive video system of the present invention, this time for an outdoor karate demonstration, this time the environmental model being further shown to be located in the static scene, particularly of...diagrammatic representation of the terms of the algorithm, of the present invention where, at each time instant, multiple vistas are computed using the current dynamic model and video streams from multiple...
...demand, (ii) the synthesis of virtual video images of a real-world scene in real time , or virtual television, (iii) the synthesis of virtual video images/virtual television pictures of a...video. MPI video is the basis, and the core, of the "immersive video" (non-real-time and "immersive telecresence" or "Visualized Reality (VisR) (real-time), systems of the present invention. The MPI Video system itself overcomes several limitations of the...a full custom virtual video image for each viewer is to be synthesized in real time and on demand requires that the model should be constructed ... A "next step" in MPI video beyond this rudimentary implementation is as a non-real-time pre-processed "game video". Such a "game video" may be recorded on the now-emerging...

... will be to send the same information on twenty-three channels live, and in real time , on game day. Subscriber/viewer voting may permit a limited interaction. For example, the "fans...and what will undoubtedly transpire only after the lapse of some years from the present time (1995), it should be possible for each fan to be his or her own "game director", and to watch in real time substantially exactly what he or she wants.

Accordingly, to exercise even the MPI video system...the MPI video system to realize untrammeled video views--including stereoscopic views. In non-real-time applications this realization, and the special processes of so realizing, are called "immersive video&. In real-time applications the realization, and the processes, are "immersive telepresence", or "visual reality", or "VisR". In...M. Hansen, P. Anandan, K. Dana, G. Van der Wal and P. Burt in Real-time scene stabilization and mosaic construction, appearing in ARPA Image Understanding Workshop, Monterey, Calif., Nov. 13 ... In particular, multiple independent streams of video data of the same scene at the same time will be seen to be input to the system. Because the system of the present...see with two eyes, we do not see things from all directions at the same time . Humans have, or course, highly evolved brains, and perception. However, at least one situation of...OF THE INVENTION

The present invention contemplates telepresence and immersive video, being the non-real-time creation of a synthesized, virtual, camera/video image of a real-world scene, typically in... of presentation is (are) normally specified by, and may be changed at times and from time to time by, a viewer/user of the system. Because the criterion (criteria) is (are)

changeable, the... cameras, and also the viewer-specified criterion (criteria) from the viewer interface. At the present time , circa 1995, the typical computer functioning in an immersive video system is fairly powerful. It...
... or several such computers that are linked together if video must be processed in real time --i.e., as television. Especially if the immersive video is real time --i.e., as television--then some or all of the computers normally incorporate hardware graphics...

... an immersive video system are both general purpose and conventional but are, at the present time (circa 1995) typically "state-of-the-art", and of considerable cost ranging to tens, and...in the teeth", it is very difficult for the system (especially initially, and in real time as television), to process through a discordant scene occurrence, such as the stadium parachutist, so...process a completely amorphous unstructured video scene--the windy jungle--into 3D, especially in real time (i.e., as television). It is, however, eminently possible to process many scenes of great...are, dealt with. The typically greater portion of any scene that is (at any one time) static is neither processed nor re-processed from moment to moment, and from frame to...to present, as a selected stream of video data containing a selected view, first scan time video data and second scan time video data that is displaced, each relative to the other, in accordance with the location...

... stream is presented in a one color, or, more commonly at present, at a one time or in a one polarization, while the other video stream is presented in a separate color, or at a separate time , or in an orthogonal polarization, and each stream is separately gated to the eye (at greater than the eye flicker fusion frequency=70 Hz) by action of colored glasses, or time -gated filters, or polarizing filters, then the image presented to the eyes will appear to...present invention provides the vast, relatively inexpensive, "database" of the real world (at all scales, time compressions/expansions, etc.) as a suitable "field of operation" (or "playground") for the characters of... a three-dimensional video representation of everything that s within a scene, especially in real time (i.e., as television).

Any desired scene view is then synthesized (alternatively, "extracted") from the...be rendered stereoscopically, as desired.

The synthesized/extracted video views may be processed in real time , as television.

Any and all synthesized/extracted video views contain only as much information as...
... the term "virtual world" is becoming a misnomer. These applications, which require accurate and real-time modeling of actions and events in the "real world" (e.g., gravity), interact with a...and experiences that are most valuable, entertaining and pleasing to most people most of the time are sensations and experiences of the real world, or at least sensations and experiences that...See B. Chapin, Telepresence Definitions, a World Wide Web (WWW) document on the Internet at URL http://cdr.stanford.edu/html/telepresence/definition.html, 1995. Key features of telepresence applications are: 1) the entire application is real- time ; 2) the virtual world is reasonably faithful to the real world being mimicked; 3) since real-time and real-world are cardinal, sensors should be used in acquiring the virtual world in...

... implementation coupled with expectation-driven, need-based analysis (described in Section 5) ensures near real-time model construction. The preferred immersive video system, described in Section 4, reconstructs realistic monocular and stereo vistas from the viewer perspective (see, for example, FIG. 10b).

Even in non-real time applications, video-based systems, such as the one taught in this specification, can be very...Assimilator and used to construct a comprehensive representation of events occurring in the scene over time (e.g. object movements and positions),

The Assimilator thus models spatial-temporal activities of objects...in a courtyard are dynamic objects pillars standing in the courtyard are static objects. The time variance of the set O sub i (t) is a result of the time variation of the dynamic objects.

As befit their name, static objects do not vary with time . The set of values of these objects at any instant comprises the state of the...In this case, comparison of objects in D sub v,i (t) at a particular time instant t with objects in S sub o,i can help anticipate and resolve such... realistic assumptions about objects of interest:

First, these objects are in motion most of the time .

Second, these objects move on known planar surfaces.

Third, these objects are visible from at...capability to integrate these techniques into analysis and assimilation modules when they become available. To date , evaluation of the preferred MPI-Video system has been done only by use of fixed...system is to keep track of object behavior and events unfolding in the environment over time .

3.3 Best View Selection

The View Selector can use a variety of criteria and...

... sub i where the index i epsilon {1, . . . , N} varies over all cameras. At every time step, t, each camera produces a video frame, F sub,i,t. The term i...

...i sub BV is the index of the camera which produces the best view at time t. Then, the best view is found by selecting the frame from camera C sub iBV at time t, i.e., the best view is F sub iBV,t.

Some possible ...object orientation.

In the case of a least occluded view criteria, the system chooses, at time t, that frame from the camera in which an object of interest is least occluded...for C sub i, e.g. as a weighted linear sum. The use of the time t in this equation supports a best view optimization which uses a temporal selection criteria involving many frames over time , as well as spatial metrics computed on each frame. This is addressed in the following ...which chooses the optimum from the set of g sub i,t 's. Note that time does not appear explicitly in the right hand side of this equation, indicating that the same best view evaluation is applied at each time step t. Note, in this case, the same g (here, a weighted linear sum) is...

...is possible. The best view is a frame from a particular camera. However, smoothness over time may also be important to the viewer or a system processing module. Thus, ...is an idea that has captured the imagination of science fiction writers for a long time . Although not feasible in its entirety, it is conjectured that limited telepresence will play a...See M. Hansen, P. Anandan, K. Dana, G. van der Wal, and P. Burt, Real-time Scene Stabilization and Mosaic Construction, in ARPA Image Understanding Workshop, Monterey, Calif., Nov. 13-16...See M. Hansen, P. Anandan, K. Dana, and G. van der Wal et al., Real-time scene stabilization and mosaic construction, in Proc. of Workshop on Applications of Computer Vision, pages... FIG. 1 outlines the steps involved. Algorithm 1 is the vista compositing algorithm. At each time instant, multiple vistas are computed using the current dynamic model and video streams from multiple...the relative placements of all four cameras. Frames from four cameras (for the same arbitrary time instant, 00:21:08:02) are shown in FIG. 6. The scene contains three walkers...effect is more discernible. A bird's eye view of the walkway for the same time instant is shown in FIG. 8a. Again, white portions represent areas not covered by any...model, the occupancy of only those voxels whose state could have changed from the previous time instant is continuously determined. Using higher level knowledge, and information from prior processing, this computation...in height.

Second, bounds are put on where the objects may be at the current time instant based on prior state, tracking information, assumptions about surfaces of motion etc.

The former... Challenge) controls these video processing work stations (slaves) and maintains the Environment Model (and associated temporal database). The central master and the remote slaves communicate at a high symbolic level and minimal... in interaction and immersion for diverse virtual world applications. One of these application is real-time virtual video, or virtual television, or telepresence--next discussed in the following section 6. Various...6. Immersive Telepresence

Immersive telepresence, or visual reality, is an immersive, interactive and realistic real- time rendition of real-world events captured by multiple video cameras placed at different locations in the environment. It is the real-time rendition of virtual video; "virtual television" instead of just "virtual video".
Unlike virtual reality, which...Corporation.

It also impossible to convey in the drawings when something is happening in real time . In some cases the multiple video feeds from a scene that was processed in real time to present telepresence to a user/view were also recorded and were then later processed telepresence and immersive video are these. First, more computer processing time is clearly available in non-real time immersive video than in immersive telepresence. This may not be, however, of any great significance...real, remote scenes. This specification and this section instead describe immersive telepresence, being the real-time interactive and realistic rendition of real-world ...See M. Hansen, P. Anandan, K. Dana, G. van der Wal, and P. Burt, Real-time scene stabilization and mosaic construction, in ARPA Image Understanding Workshop, Monterey, Calif., Nov. 13-16...See M. Hansen, P. Anandan, K. Dana, and G. van der Wal et al., Real-time scene stabilization and mosaic construction, in Proc. of Workshop on Applications of Computer Vision, pages...and present results for the Sam campus walkway

covered by multiple video cameras--only this time as television in real time as opposed to non-real-time video. Future directions for VisR are outlined in section 6.4.

6.2 Visual Reality... interactive viewer can `walk through` this dynamic, live environment in as it exists in real time (e.g., as seen through television).

6.3.1 Building a Comprehensive, Dynamic 3-D...3-D position of each dynamic object detected by a motion segmentation module in real time . A priori information about the scene and camera calibration parameters, coupled with the assumption that... to the viewing position is used in the rendition. This is then repeated for every time instant (or every frame) assuming stationary view-port. To generate a "fly-by" sequence this...and zooming into the model is expected to be useful in representing sporting events. To date no problems with camera jitter, frame dropouts etc. have been encountered in the prototype system...N. Negroponte, Being digital, Knopf, New York, 1995.

8. Immersive Video/Television At the Present Time , or How to Use Five Hundred Television Channels Beneficially

The diverse sophisticated video presentations discussed in his specification are so discussed in the necessarily formative terminology of the present time , when not enough people have seen these effects of these video presentations so as to...acknowledging that they cannot perfectly foresee the future.

Immersive video may be divided into real-time applications, i.e., immersive television, and all other, non-real-time , applications where there is, mercifully, more time to process video of a scene.

Both applications are presently at developed to a usable...

... entertainments constitute a separate market from computer games and interactive computerized tutors at the present time .

3.1 Monitoring Live Events in Real Time or Near Real Time

With high speed video digitalizers, an immersive video system based on a single engineering work station class computer can, at the present time , process and monitor (being two separate things) the video of live events in real time or near real time .

Such a system can, for example, perform the function of a "television sports ... it may ultimately be possible to have television views on demand.

Another presently-realizable real-time application is security, as at, for example, airports. An immersive video system can be directed...video of an entire observed head is available -for comparison.

The ultimate use of real-time and near-real-time immersive video may in Fact be in machine perception as opposed to human entertainment. The... for the entertainment or education of humans.

3.1 Processing of Video in Non-Real Time

Meanwhile to developments in immersive television, the processing of video information--which is not required to transpire in real time --and the communication of video information--which may be by disc or like transportable storage... with considerable computer processing. A complete 3D database of fine detail can be developed, over time and by computer processing, from historical multiple video feeds of anything from a football game...

... When recorded, a scene from the 3D database can be "played back" at normal, real- time , speeds and in accordance with the particular desires of a particular end viewer/user by...
... the receiving, the finding, the projecting, the testing and the evaluating for an instance of time of each video frame assuming a stationary viewpoint.

16. The hypermosaicing composing method according to... perspective received from the viewer.

19. The method according to claim 17 performed in real time as television presented to a viewer interactively in accordance with the viewer-specified criterion.

20... wherein the generating of the selected two-dimensional stereoscopic virtual video image is in real time on demand, thus interactive virtual television.

36. A computerized method for presenting video images including...streams transpires by tracking changes in scene element representations in the multiple video streams over time .

41. The method according to claim 36 wherein the environmental model determines whether any scene...
...is of a varying, and not a same and consistent, view on the scene from time to time .

43. The method

```
?log off
      22jun00 09:11:15 User219455 Session D638.6
           $1.47    0.309 DialUnits File349
             $10.20  2 Type(s) in Format  5 (UDF)
           $10.20  2 Types
    $11.67  Estimated cost File349
           $2.67    0.453 DialUnits File654
              $0.95  1 Type(s) in Format  2
              $3.20  1 Type(s) in Format  9 (UDF)
           $4.15  2 Types
     $6.82  Estimated cost File654
           OneSearch, 2 files,  0.762 DialUnits FileOS
     $0.25  TYMNET
    $18.74  Estimated cost this search
    $27.22  Estimated total session cost   3.742 DialUnits


### Status: Signed Off. (16 minutes)
```

WEST

Freeform Search

Database: US Patents Full-Text Database
JPO Abstracts Database
EPO Abstracts Database
Derwent World Patents Index
IBM Technical Disclosure Bulletins

Term: (705/$.CCLS.) and 118

Display: 10 **Documents in Display Format:** TI **Starting with Number** 1

Generate: ○ Hit List ◉ Hit Count ○ Image

Search | Clear | Help | Logout | Interrupt

Main Menu | Show S Numbers | Edit S Numbers | Preferences

Search History

Today's Date: 6/22/2000

DB Name	Query	Hit Count	Set Name
USPT	(705/$.CCLS.) and l18	23	L20
USPT	((364/?/)!.CCLS.) and l18	0	L19
USPT	l6 and l17	205	L18
USPT	enval$.xp.	3572	L17
USPT	l6 and l15	15	L16
USPT	hayes.xp.	3362	L15
USPT	l13 and medical	15	L14
USPT	l6 and envall.xp.	204	L13
USPT	l6 and Hayes.xp.	15	L12
USPT	l6 and (enval or Hayes).xp.	16	L11
USPT	l9 and (medical adj2 record$1)	26	L10
USPT	(diagnosis or admission or discharg$) adj6 date$1	236	L9
USPT	l6 and medical and (((364/?))!.CCLS.)	0	L8
USPT	l6 and medical and ((((364/?)))!.CCLS.)	0	L7
USPT	Tran.xa.	5666	L6
USPT	l3 and admission$1	5	L5
USPT	l3 and (((705/?))!.CCLS.)	2	L4
USPT	l1 and medical	199	L3
USPT	(tran, Kkai).xa.	5666	L2
USPT	(tran, Kahi).xa.	5666	L1

WEST

Help | Logout | Interrupt

Main Menu | Search Form | Posting Counts | Show S Numbers | Edit S Numbers | Preferences

Search Results -

Terms	Documents
l9 and (medical adj2 record$1)	26

Database: US Patents Full Text Database
JPO Abstracts Database
EPO Abstracts Database
Derwent World Patents Index
IBM Technical Disclosure Bulletins

Refine Search: l9 and (medical adj2 record$1) Clear

Search History

Today's Date: 6/22/2000

DB Name	Query	Hit Count	Set Name
USPT	l9 and (medical adj2 record$1)	26	L10
USPT	(diagnosis or admission or discharg$) adj6 date$1	236	L9
USPT	l6 and medical and (((364/?))!.CCLS.)	0	L8
USPT	l6 and medical and ((((364/?)))!.CCLS.)	0	L7
USPT	Tran.xa.	5666	L6
USPT	l3 and admission$1	5	L5
USPT	l3 and (((705/?))!.CCLS.)	2	L4
USPT	l1 and medical	199	L3
USPT	(tran, Kkai).xa.	5666	L2
USPT	(tran, Kahi).xa.	5666	L1